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A new species in the *Pardosa lugubris* group from Central Europe

(Arachnida, Araneae, Lycosidae)

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Pardosa baehrorum, spec. nov. is described on material from Central Europe and compared with its close allies *P. alacris* (C. L. Koch) and *P. lugubris* (Walckenaer). Distinct morphological differences between the three species mentioned are clearly expressed in the male sex, notably in secondary sexual characters. *P. baehrorum* has hitherto been found only in drained flood plain woods ('Auwälder') in southern Germany and Austria.

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Introduction

The courtship behaviour in *Pardosa lugubris* (Walckenaer), *P. alacris* (C. L. Koch) (sub *P. pseudolugubris* Wunderlich) and two allied, by then formally unnamed species were studied in southern Germany by Gabriele Töpfer-Hofmann some years ago (Töpfer 1990). One of the formally undescribed species is known as *P. 'saltans'* sensu Töpfer-Hofmann & von Helversen (1990) (formal description will follow: Töpfer-Hofmann, Cordes & von Helversen in prep.), while the other one is *P. baehrorum*, spec. nov., described below¹.

Wunderlich (1984) described *Pardosa pseudolugubris* on material from various parts of Europe. This species is morphologically similar to *P. lugubris* (Walckenaer), distinct differences between the two species so far being disclosed in the male sex only (Wunderlich 1984). Recently, Kronestedt (1992) presented arguments that *P. pseudolugubris* was previously described under the name *Lycosa alacris* C. L. Koch, 1833 (cf. also Töpfer-Hofmann & von Helversen 1990).

Pardosa baehrorum was first discerned as a separate species on morphological grounds some years ago by Dr. Barbara Baehr from material collected in Bavaria. Also this species exhibits a strong similarity to *P. lugubris* in the configuration of the male and female copulatory organs. The male of this new species is, however, clearly separable from those of *P. lugubris* and *P. alacris* in certain somatic characters.

The males of *Pardosa baehrorum* from the type locality were collected together with females. This locality, however, also harboured *P. lugubris*. While the males are easy to separate, no distinct character gap could be found between the females. Measuring of tibia I length/carapace length and tibia IV length/carapace length ratios, respectively, and length/width ratios of epigynes did not point at any clear difference in proportions among the females from the *baehrorum* type locality. Because of the small

¹ The name "*baehrorum*" was given by Kronestedt (in litt.) and used by Töpfer-Hofmann & von Helversen (1990) who expressly declared that its mentioning was not a formal introduction of a new name. The name has also appeared in Blick & Scheidler (1991) and Buchar & Thaler (1997).

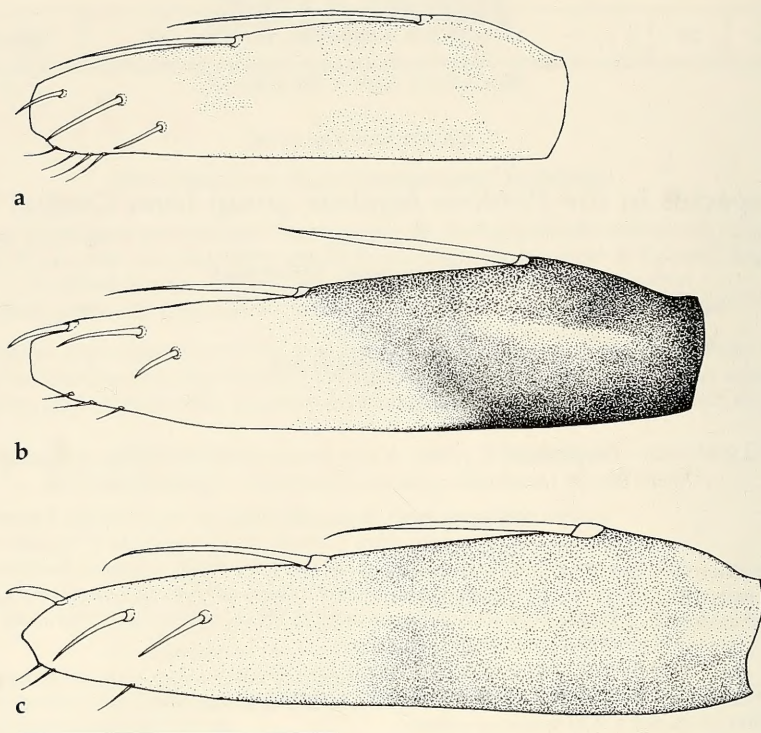


Fig. 1. Right male first femur, prolateral view, showing pigmentary pattern. a. *Pardosa baehrorum*, spec. nov. (DE: Bavaria). b. *P. alacris* (C. L. Koch) (SE: Skåne). c. *P. lugubris* (Walckenaer) (SE: Dalarna). Scale: 1 mm.

body length of the *P. baehrorum* males, conspecific females were expected to be small. Below is given a description of the smallest female available from the *baehrorum* type locality, here regarded to be conspecific with the male. This female has a light yellowish colour of the legs (comparable with conspecific males) while *lugubris* females have the yellowish leg colour with a slightly more brownish tinge. Discovery of a local, "pure" population of *P. baehrorum* is needed in order to get a better characterization of the female.

Due to the sharing of characteristics in the copulatory organs (e. g. shape of embolus and terminal apophysis), all above-mentioned species are assigned to a separate group of species, the *Pardosa lugubris*-group (Töpfer-Hofmann & von Helversen 1990).

Material and methods

The description is based on alcohol material. For comparison, material of *P. alacris* and *P. lugubris* from Germany (DE) (Bavaria) and *P. alacris* from Sweden (SE) (province of Skåne) was used. Moreover, material of *P. lugubris* from different parts of Sweden was studied. Occasional observations on the courtship behaviour in males assigned to *P. lugubris* from the Stockholm area (province of Uppland) demonstrated that this material clearly belongs to *P. lugubris* s. str., i. e. the species without any conspicuous visual stereotypic component in its courtship behaviour (in accordance with Töpfer 1990, Vlček 1995, Töpfer-Hofmann et al. in prep.).

Measurements refer to specified individuals and are given in mm except for eyes. Eyepiece micrometer units (given for eyes) can be converted to mm by dividing by 80. Body parts for scanning electron microscopy were taken from preserved specimens, dehydrated in ethanol, transferred to and stored in xylene, air-dried, mounted on stubs, sputter-coated with gold and examined in a Philips SEM 515.

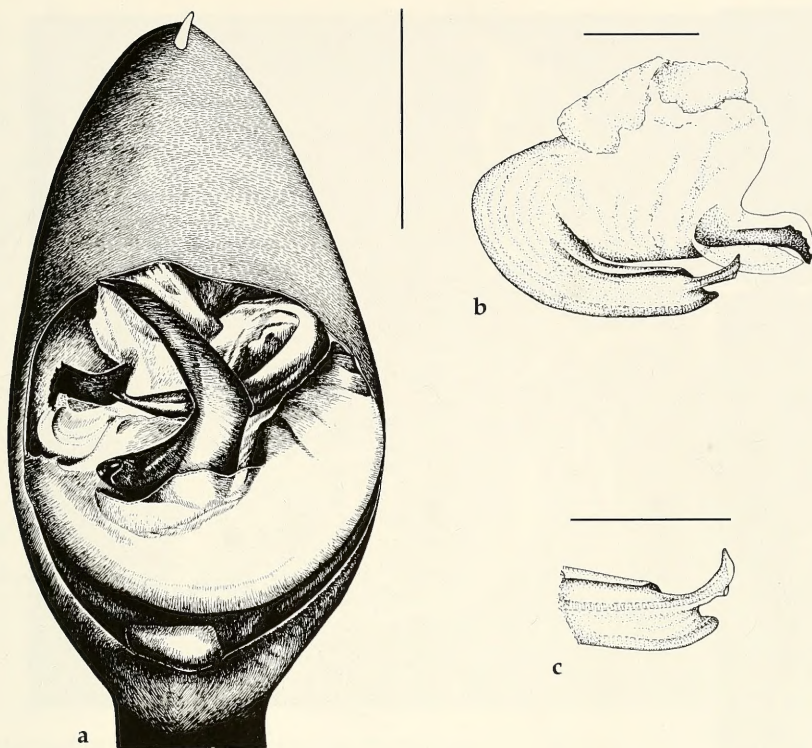


Fig. 2. *Pardosa baehrorum*, spec. nov. (DE: Bavaria). **a.** Right male palp, ventral view. **b.** Terminal part with embolus of left male palp, viewed from in front. **c.** Tip of left embolus, viewed from in front. Scales: 0.25 mm (a), 0.1 mm (b, c).

Deposition of material

- CTh Collection of K. Thaler, Zoologisches Institut, Universität Innsbruck, Innsbruck
 NRS Swedish Museum of Natural History (Naturhistoriska riksmuseet), Stockholm
 SMF Forschungsinstitut Senckenberg, Frankfurt/M.
 ZSM Zoologische Staatssammlung, Munich

Pardosa baehrorum, spec. nov.

Figs 1a, 2, 3a-e, 4, 5a, 6a, 7

Holotype: ♂, from Germany: Bavaria, Pupplinger Au at River Isar (south of Munich), 13.V.1983 (M. Baehr), deposited in ZSM.

Diagnosis. Males differ from *P. alacris* and *P. lugubris* by shorter legs (cf. Fig. 9), by leg femora being yellowish with more or less distinct darker (greyish) annulation (cf. Figs 1a-c), by distal portion of cymbium being short (cf. Figs 6a-c), and by entire cymbium being blackish. No characters have so far been found for unambiguously distinguishing the females.

Description

Male (holotype). Total length 4.0; carapace 2.20 long, 1.60 wide.

Carapace. Brownish, with distinct light brown median band and more or less distinct more or less broken lateral bands. Sides of thoracic part with recumbent dark (most numerous) and lighter hairs.

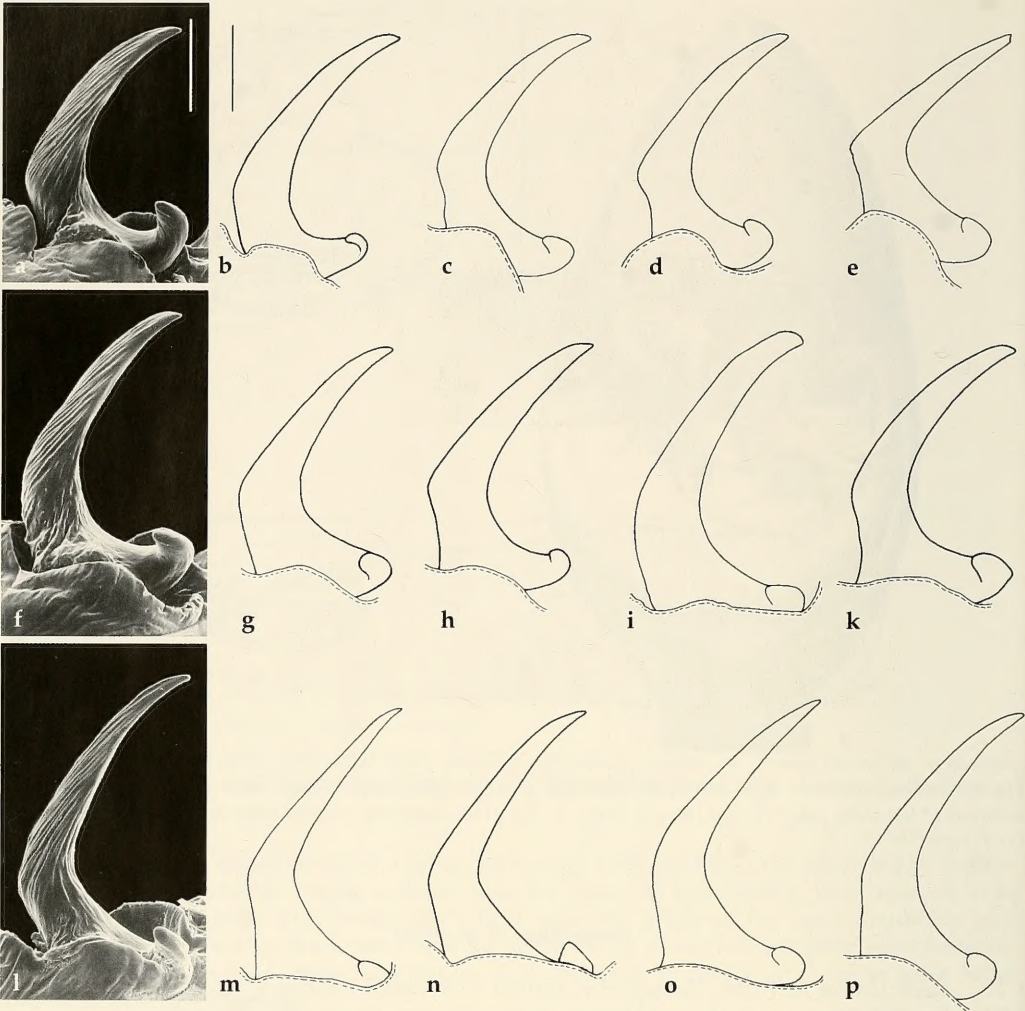


Fig. 3. Tegular apophysis of left male palp. **a-e.** *Pardosa baehrorum* spec. nov. (**a-d**, DE: Bavaria; **e**, AT: Niederösterreich). **f-k.** *P. lugubris* (Walckenaer) (**f-h**, DE: Bavaria; **i, k**, SE: Uppland). **l-p.** *P. alacris* (C. L. Koch) (**l-n**, DE: Bavaria; **o, p**, SE: Skåne). Scales: 0.1 mm.

Median band and lateral bands with recumbent whitish hairs. White hairs along carapace margin. Clypeus yellowish to light greyish brown. Chelicerae yellowish to greyish brown, with sooty longitudinal stripes proximally, fronto-distally more or less sooty; furnished with long and short dark hairs. Sternum light to greyish brownish, sometimes with indistinct yellowish median stripe; furnished with recumbent light and fewer erect dark hairs.

Eyes. Width of row I 36 (slightly procurved as seen from front), row II 55, row III 70, row II-III 54. Diameter of AME 8, ALE 7, PME 21, PLE 17. Distance between AME 5, between AME and ALE 2.

Abdomen. Dorsally brownish with greyish-bordered brownish lanceolate stripe and rearwards with some greyish transverse bars. Sides of abdomen mottled in greyish and brownish. Venter yellowish to greyish brown with greyish spots. Dorsum and sides with whitish hairs, in darker (greyish) parts also with dark hairs. Venter with numerous recumbent dark hairs and fewer scattered, more erect, stouter short dark hairs (*alacris* with recumbent greyish and dark and scattered, more erect dark hairs; *lugubris* with recumbent whitish hairs and scattered, more erect dark hairs).

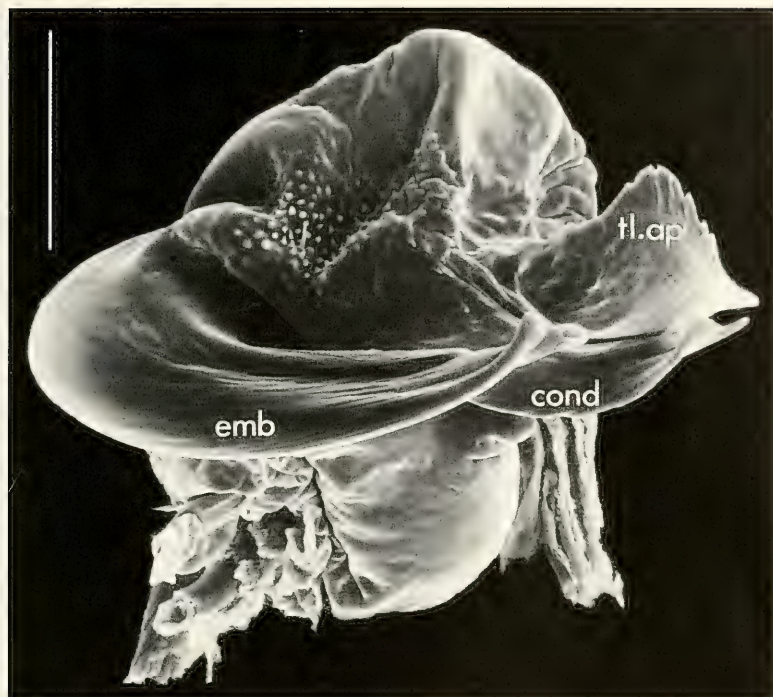


Fig. 4. *Pardosa baehrorum*, spec. nov. (DE: Bavaria). Terminal part of left male palp with embolus (*emb*), conductor (*cond*) and terminal apophysis (*tl. ap*). Scale: 0.1 mm.

Legs. Yellowish, with more or less sooty annulation present in femora (visible mainly on dorsal side) and, very indistinct, in tibiae and metatarsi. Annulation in Fe I (Fig. 1a) and II fainter and the rest of legs I and II sometimes without traces of annulation. Coxae and trochanters more or less sooty on dorsal side. Ti I lacking distal retrolateral spine.

Leg	Fe	Pt	Ti	Mt	Ta	Total
I	1.65	0.70	1.45	1.55	1.05	6.40
II	1.55	0.70	1.35	1.50	1.00	6.10
III	1.50	0.65	1.20	1.60	0.90	5.85
IV	2.00	0.75	1.75	2.50	1.20	8.20

Palp (Fig. 2a). Patella 0.45, tibia 0.45, cymbium 0.90. Femur, patella and tibia blackish brown and furnished with dark hairs. Tibia with somewhat longer dark hairs pro- and retroventrolaterally, many of them relatively stout. Cymbium comparatively short (Fig. 6a), with terminal claw. Shape of tegular apophysis (Figs 3a-e) slightly variable [cf. *P. lugubris* Figs 3f-k (shape variable), and *P. alacris* Figs 3l-p (shape variable, anteriorly directed branch often narrower than in *baehrorum* and *lugubris*)]. Terminal apophysis like a smoothly curved, corrugated, sclerotized lamina, anterior rim in part serrated (Figs 2b, 4, 5a). Most of embolus relatively wide, distal part narrow and curved (Figs 2b, c, 5a), similar to *lugubris* (cf. Fig. 5b) [distal part in *alacris* narrower (cf. Figs 5d, e) compared with *baehrorum* and *lugubris*].

Female (same locality as holotype). Total length 5.6, carapace 2.35 long, 1.80 wide.

Carapace. Brownish with yellowish median band and broken lateral bands. Sides of thoracic part with short recumbent dark hairs, nearest to lateral bands and in these with recumbent whitish hairs. Median band with recumbent white pubescence. Clypeus yellowish. Chelicerae yellowish with darker longitudinal stripes; furnished with whitish and a few darker hairs. Sternum greyish brown with lighter indistinct median stripe in anterior part.



Fig. 5. Embolus (*emb*) and terminal apophysis (*tl. ap*) of left bulbus in frontal view. **a.** *Pardosa baehrorum*, spec. nov. (DE: Bavaria). **b, c.** *P. lugubris* (Walckenaer) (**b**, SE: Dalarna; **c**, SE: Uppland). **d, e.** *P. alacris* (C. L. Koch) (**d**, DE: Bavaria; **e**, SE: Skåne). Scale: 0,1 mm.

Abdomen. Dorsally with brownish lanceolate stripe and obscure brownish/greyish pattern and pubescence of recumbent whitish hairs and short stouter dark hairs. Sides of abdomen dark greyish with white pubescence. Venter brownish with recumbent whitish pubescence and few scattered erect dark hairs.

Legs. Yellowish with greyish annulation/spotting (except tarsi). Ti I lacking distal retrolateral spine.

Leg	Fe	Pt	Ti	Mt	Ta	Total
I	1.80	0.80	1.60	1.45	0.95	6.60
II	1.75	0.80	1.40	1.45	0.90	6.30
III	1.70	0.75	1.30	1.65	0.90	6.30
IV	2.30	0.85	2.00	2.85	1.20	9.20

Epigyne (Fig. 7). Septum (incl. septal ridge) shaped like an inverted T. Anterior transverse pockets clearly separated. Shape of epigyne similar to that in *P. lugubris* (Fig. 8b) and *P. alacris* (Fig. 8c). In

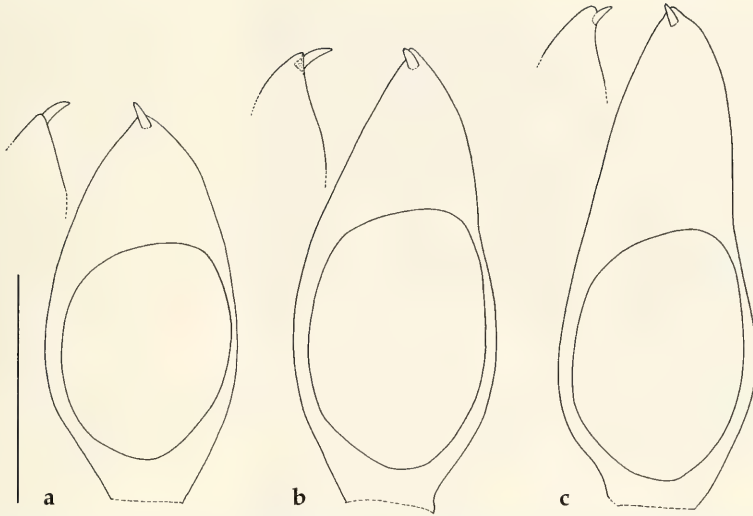


Fig. 6. Left cymbium in ventral view (insets: apical part in prolateral view). **a.** *Pardosa baehrorum*, spec. nov. (DE: Bavaria) **b.** *P. lugubris* (Walckenaer) (SE: Uppland). **c.** *P. alacris* (C. L. Koch) (SE: Skåne). Scale: 0.5 mm.

contrast to *P. baehrorum*, the septal ridge in *P. alacris* is often characteristically widened anteriorly (cf. Fig. 8c; septal wrinkles are also visible in dried material under a stereomicroscope). Among the females initially (and intuitively) attributed to *baehrorum*, the length of the epigynal septum was considerably longer in relation to the width of the posterior transversal part of the septum (cf. Fig. 7). However, no distinct “gap” in this relation was found when comparing with females attributed to *lugubris* [many of which have the length of the epigynal septum shorter than (or equal to) the width of the posterior transversal part of the septum: Fig. 8b]. Fig. 8a shows the epigyne from a female of uncertain identity (*baehrorum* or *lugubris*). An account of the configuration of the copulatory ducts and receptacula will have to wait until females from a “pure” population of *baehrorum* becomes available.

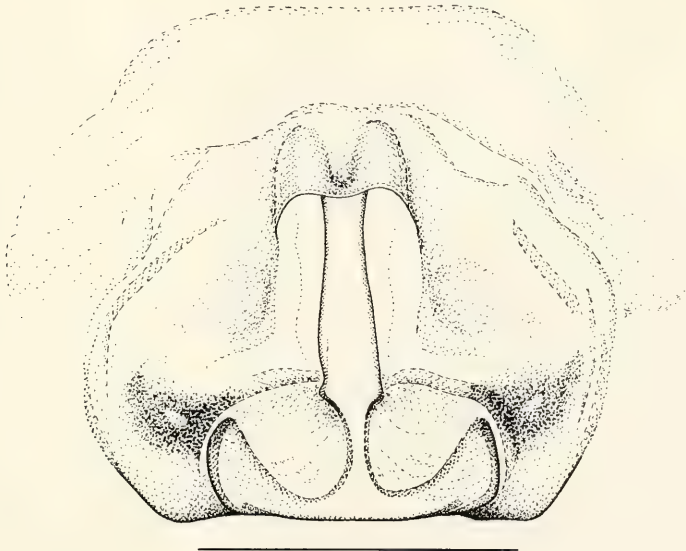


Fig. 7. *Pardosa baehrorum*, spec. nov. Epigyne. Scale: 0.25 mm.

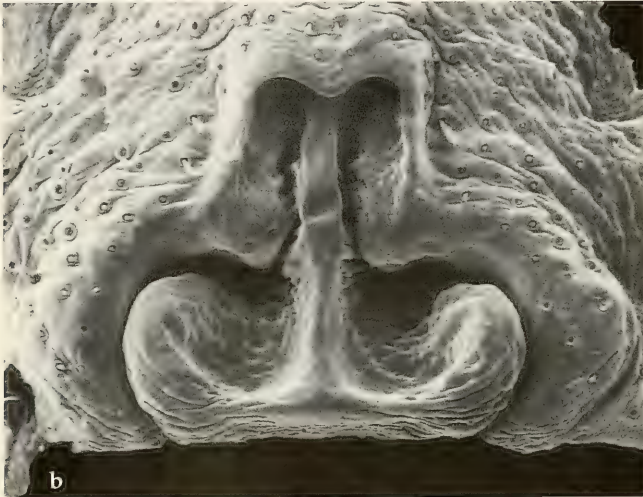


Fig. 8. Epigyne. **a.** *Pardosa* sp., identity uncertain, carapace length 2.45 (DE: Bavaria, Pupplinger Au). **b.** *P. lugubris* (Walckenaer) (SE: Uppland). **c.** *P. alacris* (C. L. Koch) (DE: Bavaria). Scale: 0.2 mm.

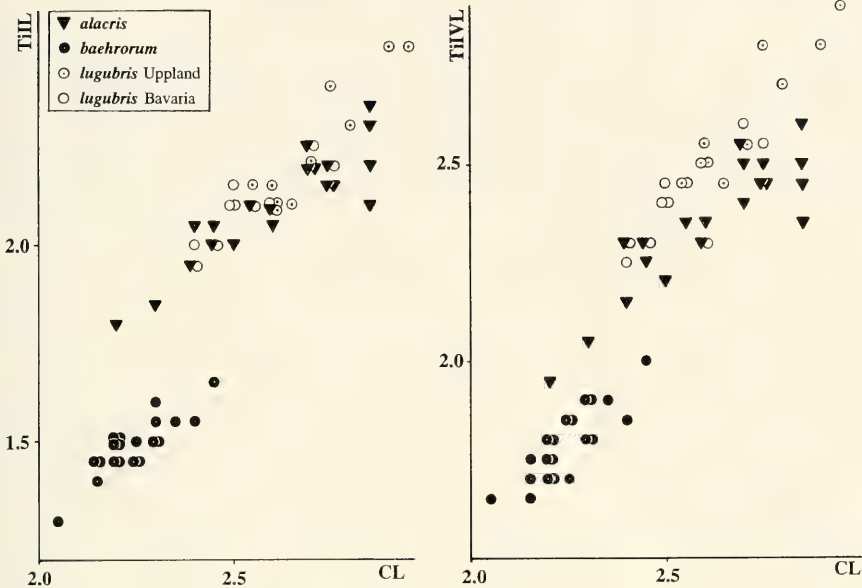


Fig. 9. Tibia I length (TiIL) and tibia IV length (TiIVL), respectively, versus carapace length (CL) in males of *Pardosa baehrorum*, spec. nov. (DE: Bavaria), *P. alacris* (C. L. Koch) (different localities in DE: Bavaria), and *P. lugubris* (Walckenaer) (localities in DE: Bavaria and SE: Uppland).

Size variation. Carapace lengths of males measured: males 2.05-2.45 (N=20). Tibia I and tibia IV lengths, respectively, versus carapace length given in Fig. 9. The relative length of leg I in the *baehrorum* males is notably shorter compared with the condition in the *alacris* and *lugubris* males.

The size variation of *baehrorum* females is excluded for reasons given above. The carapace lengths of the available females of *baehrorum*+*lugubris* from Pupplinger Au (N=22) were between 2.35 and 3.05, the *baehrorum* females likely to be among the smaller specimens. For comparison, the carapace lengths of a sample of 10 *lugubris* females from SE: Uppland ranged between 2.60 and 3.10.

Material examined. AUSTRIA. *Niederösterreich*. Orth, Ellender Haufen (E of Vienna), 1972-73 (H. M. Steiner, CTh), 8♂♂ (see also Buchar & Thaler 1997). – GERMANY. Bayern, Pupplinger Au at River Isar (S. of Munich), 24.VI.1982, 13.V., 13.VI. & 8.VII.1983 (M. Baehr, NRS, SMF, ZSM) 24♂♂, 1♀ [holotype and ♀ in ZSM]; Aumühle at River Isar, 26.V.1982 (M. Baehr, ZSM), 3♂♂.

Distribution and habitat. Austria and Germany (Fig. 10). So far *P. baehrorum* has been met with in a type of habitat which in German is named 'Auwald' [=drained flood plain wood (English term used in Ellenberg 1988)]. This type of habitat (also called bottomland forest) is endangered in Central Europe (Thaler & Steiner 1989, with further references). It remains to be found whether this species shows a preference for this habitat or if it has a wider habitat amplitude.

Etymology. The specific name is a patronym in honour of Dr. Martin Baehr, collector of part of the original material, and Dr. Barbara Baehr who drew my attention to the material from the type locality.

Discussion

The species here dealt with show that the morphology of the copulatory organs may in certain cases be up to its limits as a tool for separating species in Lycosidae. Additional characteristics, as size proportions of body parts, coloration and/or pilosity may in instances be more informative for recognizing species. Such characteristics are usually expressed as secondary sex characters in the male only.



Fig. 10. Collection localities of *Pardosa baehrorum*, spec. nov.

The male of *Pardosa baehrorum* is clearly separable from the males of *P. alacris* and *P. lugubris* by the somatic characters mentioned in the diagnosis, i. e. the relative leg lengths as well as the coloration and form of cymbium. Otherwise, the configuration of the palpal organs of the three species is very similar. The tegular apophysis in all three species is subject to considerable intraspecific variation. Wunderlich (1984) noted that the anteriorly directed branch of the tegular apophysis in *alacris* is often but not always narrower than in *lugubris*. Also in the present material, no absolute difference in this respect was found. The embolus exhibits a certain but similar complexity apically in all three species. In this respect, *P. alacris* differs by its distalmost part being somewhat longer and narrower than the corresponding part in *P. baehrorum* and *P. lugubris*.

Töpfer (1990) and Töpfer-Hofmann & von Helversen (1990) stated that the courtship behaviour in *P. alacris*, *P. baehrorum*, *P. lugubris*, and *P. 'saltans'* (sensu Töpfer-Hofmann & von Helversen, 1990), respectively, is distinct, further supporting their separation at the species level. These ethological characteristics are highly significant as the four species are sympatric, thus acting as part of the specific mate-recognition system. A comparative study of the courtship behaviour in three of these species (*P. baehrorum* not included) (Vlěček 1995) further supported the significant ethological differences between the species. The courtship behaviour in all four species will be treated by Töpfer-Hofmann, Cordes & von Helversen (in prep.). A considerable variation in courtship behaviour between different populations of *P. lugubris* was accounted for by Vlijm & Dijkstra (1966), raising a suspicion that more than one biospecies were involved in their study and at that time collectively included under this name.

Pardosa lugubris has previously, together with *P. amentata* (Clerck), been assigned to the *amentata* group (Zyuzin 1979, Wunderlich 1984). Because of the configuration of the terminal part of the bulbus (*P. amentata*: Wunderlich 1984, fig. 33, and own obs.), these two species do not appear to be morphologically closely allied. On the other hand, *P. caucasica* Ovtsharenko has characters (shape of embolus, terminal apophysis, epigyne) meriting its inclusion in the *lugubris* group (Ovtsharenko 1979 and own obs.).

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